Arrangement for Bearing for a Seat

Field of the invention

The present invention relates to a mounting for a seat, in particular a chair, but is also suitable for stools, individual seats on a bench or fixed seats in vehicles or, for example, in stadiums or parks. The invention specifically concerns a seat mounting which makes it possible for the seat to swing resiliently in all directions or in defined directions. Such seats follow the user's posture and, beyond the resilient mounting of the seat cushion, give the seat user a freer feeling of swinging action.

Prior art

Mountings for seats are known in a wide range of designs. For work chairs, in particular, the capacity for height adjustment and the resilient mounting of the backrest are standard nowadays (see, for example, WO 98/16140). Many chairs are equipped with a synchronizing mechanism, as a result of which a movement of the backrest is followed by a simultaneous, synchronous movement of the seat surface. The capacity for height adjustment is brought about mostly by a pneumatic spring, while, for the synchronizing mechanisms, use is made of helical springs, pneumatic springs, torsion rods or combinations thereof (e.g. US 5,417,473; EP 0 839 478 A1; WO 00/22961). WO 90/14031 discloses a mechanism in which the seat carrier is seated on a ball-and-socket joint, with the result that the seat can be rotated and inclined. The set rotary position and inclination can be arrested by means of a catch. In order to have resilient seat movement in the forward direction, use is also made of rubber bodies which are compressed between a fixed framework part and the moveable seat carrier as the load to which the front seat edge is subjected increases (see, for example, US 3,863,982; US 4,890, 886).

The chair mechanisms which are relevant to the present invention make it possible for the seat to swing resiliently in all directions. Such chairs, stools and the like tend to move in the direction of the inclination or shift in the center of gravity of the user's body and extend the freedom of movement beyond the resilient mounting

of the seat cushion, with the result that the seat user feels the swinging action. For this purpose, it has been practised for the central column of the seat to be divided horizontally and for a radially encircling rubber ring to be introduced (see CH 685 848; DE 43 01 734 A1) or for a planar rubber cushion to be arranged between the divided central column (see CH 678 388; US 5,024,485). Either these designs barely provide the desired swinging effect or else the user has a certain feeling of instability and, in the case of deflection, immediately feels that it is harder to sense where the desired movement is going to stop.

FR 2 514 303 discloses, from the field of mechanical engineering, in particular of engine mounting, a vibration-absorbing arrangement in order to reduce the vibrations to which the framework is subjected. For this purpose, a damping element with a more or less insulating elastomer layer introduced therein is arranged between the vibration source and the framework side. Apart from the fact that this damping element, from a totally different field of expertise, has a quite different task – from mounting a seat – such a damping element is not suitable for mounting a swinging seat.

Object of the invention

In view of the mountings for a seat with swinging freedom of movement not being fully effective up until now, the object of this invention is to propose such a mounting which is more effective and has an improved service life. It is also the aim here for it to be possible for the mounting to be efficiently mass-produced and instooled in different seats.

Summary of the invention

The mounting for a seat which rests on an underframe has a spring element arranged on the underframe. The spring element is positioned in a casing and allows the casing to move elastically in the horizontal plane. The casing is connected to the seat or forms a part thereof.

The following features constitute advantageous embodiments of the invention: the spring element is arranged at the top of an axial column of the underframe, pref-

erably on an extensible, axially acting spring. The spring element is intended, in particular, for being arranged at the top of an axially extensible push rod of a pneumatic spring. The spring element has an elastic outer sleeve, e.g. a rubber body. The casing has a bottom, cup-like part in which the spring element is seated. The spring element and the casing have an axial through-passage. Alternatively, the casing, in which the spring element is seated, is a cup-like part which encases the spring element from above.

The spring element comprises an inner, preferably metallic core and the elastic outer sleeve, which is arranged thereon. The core has an opening, preferably an axial through-passage, for accommodating the column. The radial, outer circumference of the outer sleeve of the spring element is preferably cylindrical or tapers conically in the upward direction or is essentially of cylindrical shape with a top and bottom reduction in diameter. The core is fixed to the outer sleeve.

In a variant of the mounting, the spring element is restrained at the top by a top molding, which is connected to the casing arranged at the bottom, the seat being fastened on the top molding. In an alternative variant, the casing, which is positioned on the spring element from above, is fixed to the outer sleeve, it being possible for the casing to have a flange for connection to the seat.

The axial through-passage preferably narrows conically. Provided in the top molding or in the casing, which is positioned on the spring element from above, coaxially with the pneumatic-spring-forming central column, is a through-opening for the purpose of actuating the triggering push rod of the pneumatic spring. In order to limit the moveability of the seat, the through-opening in the top molding or the casing, which is positioned on the spring element from above, has a defined geometry, e.g. a slot. The internal core of the spring element then has an extension which projects into the through-opening and is guided therein.

The specific advantages of the mounting according to the invention are the result of the above set object being achieved, i.e. of the improvements for the user in

terms of functioning and costs and of the design-related and cost-related effects for the manufacturer.

Brief description of the attached drawings

In the drawings:

Figure 1: shows a front view of a conventional chair;

Figure 2A: shows the view according to Figure 1 with the moveability of the seat illustrated schematically;

Figure 2B: shows the plan view of the chair according to Figure 2A as a motion diagram;

Figure 3: shows an exploded view of a *first embodiment* of the seat mounting according to the invention with a *first variant* of the spring element, in the chair according to Figure 1;

Figure 4A: shows a partial section of the *first embodiment* of the seat mounting with the *first variant* of the spring element according to Figure 3, in the assembled state, in a rest position;

Figure 4B: shows the arrangement according to Figure 4A inclined laterally to the maximum extent;

Figure 5A: shows a partial section of the *first embodiment* of the seat mounting according to Figure 4A with a *second variant* of a spring element with inclination limiting, in a rest position;

Figure 5B: shows the arrangement according to Figure 5A inclined laterally to the maximum extent;

Figure 6A: shows, in vertical section, the *first variant* of the spring element from the seat mounting according to Figures 4A and 4B;

Figure 6B: shows, in vertical section, the *second variant* of the spring element from the seat mounting according to Figures 5A and 5B;

Figure 7A: shows a side view of a further conventional chair;

Figure 7B: shows a front view of the chair according to Figure 7A;

Figure 8: shows an exploded view of a *second embodiment* of the seat mounting according to the invention with the *first variant* of the spring element, in the chair according to Figure 7A;

Figure 9A: shows a partial section of the arrangement according to Figure 8 in the assembled state, in a rest position;

Figure 9B: shows a partial section of the *second embodiment* of the seat mounting according to the invention with the *second variant* of the spring element in the arrangement according to Figure 9A, with inclination limiting, in a rest position;

Figure 10: shows, as a basic illustration in vertical section, a *third embodiment* of the seat mounting according to the invention with a *third variant* of a spring element;

Figure 11A: shows, as a basic illustration in vertical section, a *fourth embodiment* of the seat mounting according to the invention with a *fourth variant* of a spring element; and

Figure 11B: shows a partial section of the arrangement according to Figure 11A in the assembled state, in a rest position.

Exemplary embodiments

A number of exemplary embodiments of the seat mounting according to the invention are described in detail hereinbelow with reference to the attached drawings.

Figure 1

The chair comprises an underframe **1**, in this case a conventional star-shaped base, from the center of which a central column **2** extends vertically. The central column **2** may be an unalterable support or may contain an axially acting spring, e.g. a helical spring, a pneumatic spring or a combination thereof. The central column **2** has positioned on it the seat **3** – in this case in the form of a seat shell – in which the user sits. It would also be possible for the seat to be designed as a, for example, angled structure or as a stool top.

Figures 2A and 2B

These figures illustrate the purpose of the invention schematically, namely to provide a mounting for a seat, including a chair, of which the seat allows a swinging movement in the horizontal plane, from a rest position **0**, in all directions **R1** to **RX**, the maximum movement from the rest position **0** being defined by the inclination angle α. For certain applications, the design can establish the possible directions **R1** to **RX** – e.g. only laterally or from the front to the rear – as will be described at a later stage in the text.

Figure 3

The underframe **1**, the central column **2** – typically a pneumatic spring – and a shell-like seat **3** are provided here. It is also possible to see a tubular pneumatic-spring covering **20** and a cylindrical push-rod extension **21**. A triggering lever **22** fitted beneath the seat **3** is provided for actuating the pneumatic spring **2**. A *first embodiment* of the mounting comprises a *first variant* of a spring element **4**, a bottom, cup-like casing **5** and a top molding **6**, in this case in the form of a cover plate which is intended for fastening on the top side of the base of the seat **3**. Finally, a seat-cushion panel **30**, which covers the top molding **6**, is provided. The spring element **4** is roughly cylindrical with reduced-diameter sections **40**,**41** at the top and bottom, a central section **42**, an outer sleeve **43**, a core **44** and an axial through-passage **45**, the latter running through the core **44**.

Figure 4A

In the case of the *first embodiment* of the mounting, in the instooled state, the *first variant* of the spring element **4** is accommodated, via the bottom section **41** and the central section **42**, basically in a form-fitting manner by the cup part **50** of the casing **5**. The top section **40** is enclosed basically in a form-fitting manner by the shaped collar **60** on the underside of the top molding **6**, said collar having complementary contours. The spring element **4** is fitted, by way of its axial through-passage **45**, on the pneumatic spring **2**, which terminates conically at the top and has the push-rod extension **21** positioned axially on its triggering push rod **23**, said extension projecting upward out of the axial through-passage **45**, with the re-

sult that the triggering lever **22** is located thereon. Provided in the plate-like molding **6**, around the emerging push-rod extension **21**, is a cutout **61**, which provides free space in all directions **R1** to **RX** during swinging movement. Above the cup part **50**, the casing **5** has an outwardly oriented horizontal flange **51**, on which the annular flange **62** of the molding **6**, said flange projecting beyond the shaped collar **60**, rests and extends further outward by way of its outer border **63**. The shaped collar **60** projects into the cup part **50**. The flange **51** and annular flange **62**, located thereon, are connected, e.g. screwed, to one another. The outer border **63** is connected, e.g. likewise screwed, to the shell-like seat **3**. The seat shell **3** grips beneath the spring element **4**, which is restrained between the casing **5** and the top molding **6**.

Figure 4B

In the case of the seat **3** being deflected from the rest position **0** to the maximum possible inclination angle α, the elastic outer sleeve **43** of the spring element **4** is temporarily deformed in its restraint, as an increasing spring resistance develops. The deflection takes place by the action of force, namely by the user's weight shifting.

Figures 5A and 5B

In the case of the *first embodiment* of the mounting, in contrast to the previous pair of figures, Figures 4A and 4B, use is made of a *second variant* of a spring element **4**. In this case, the core **44** extends axially upward as core continuation **440** and thus projects into the cutout **61**. In the case of the seat **3** being deflected from the rest position **0**, the core continuation **440** strikes against the border of the cutout **61** in the case of the maximum possible inclination angle α. The geometrical configuration of the cutout **61**, in conjunction with the dimensions of the core continuation **440**, allows the maximum possible inclination angle α to be defined or movement directions to be determined, e.g. only to the side or only from the front to the rear. This can be achieved by a correspondingly slot-like cutout **61**. It would also be possible for other, crosswise or diagonal movement patterns to be formed in such a way.

Figures 6A and 6B

To complement the central column **2** – mostly the pneumatic spring – which terminates conically at the top, the axial through-passage **45** of the spring element **4** is likewise conical. In order to optimize the movement characteristics, it has been found to be advantageous for the core **44** in the spring element **4** to be widened as a radial bead **441** in the region of the central section **42**. It is thus possible, in the case of a relatively high level of deflection from the rest position **0**, for material of the elastic outer sleeve **43** to be supported on the radial bead **441** and for a relatively high spring resistance to develop. In the case of the *first variant* of the spring element **4** (according to Figure 6A), the core **44** terminates with the top section **40** of the outer sleeve **43**.

The *second variant* of the spring element **4** (according to Figure 6B) with a core continuation **440** is provided if the intention is to limit the swinging movement of the seat **3** to a maximum permissible inclination angle α or in accordance with a specific movement pattern. It would be possible for the elastic outer sleeve **43** to consist, for example, of a specifically suitable rubber mix, whereas the core **44** is preferably metallic.

Figures 7A to 9B

A *second embodiment* of the seat mounting according to the invention is illustrated here. Once again, an underframe **1**, a central column **2** – preferably a pneumatic spring – a seat **3**, the spring element **4**, the bottom casing **5'** and a top molding **6'** are provided for this chair. The special feature here is that, rather than being formed by a separate plate, the top molding **6'** is formed by a correspondingly contoured aperture **60'** in the seat carrier **6'**. The aperture **60'** encloses the top section **40** of the spring element **4** in the same way as the shaped collar **60**. The cutout **61'** is provided again in the seat carrier **6'**. The casing **5'** is inserted into the aperture **60'** by way of its top border, is enclosed by the seat carrier **6'** and is connected to the latter, the spring element **4** being more or less encapsulated in the process. The cutout **61'** provides the freedom of movement as deflection from the rest position **0**.

If use is made of the *first variant* of the spring element **4** (according to Figure 6A), as is the case with the arrangement in Figure 9A, the moveability of the seat **3** resting on the central column **2** is more or less unlimited. If use is made of the *second variant* of the spring element **4** (according to Figure 6B) with the core continuation **440**, as the arrangement in Figure 9B shows, it is possible to limit the movement as described above (see Figures 5A and 5B).

Figure 10

In the case of this *third embodiment* of the seat mounting, use is made of a *third variant* of a spring element **4**, which is likewise intended for fitting onto a central column **2**. The sheath-like core **44** has an axial through-passage **45** for accommodating the top end of the central column **2**, preferably a pneumatic spring with a telescopically extensible lifting rod. It is advantageous if the axial through-passage **45**, to complement the lifting rod, narrows conically upward.

The core **44**, consisting, for example, of steel, has an encircling shoulder surface **442**, which is preferably produced by an outside cone with a diameter which tapers in an upwardly sloping manner. A conical outer sleeve **43** made of elastic material, e.g. rubber, is arranged on the shoulder surface **442**. The outer sleeve **43** is enclosed by a top molding **600**, with the result that the latter constitutes a casing **600** for the outer sleeve **43**. In order to ensure optimum functioning, the core **44** should be fixed to the outer sleeve **43** and the latter should be fixed to the top molding **600**. The spring element **4** is thus a three-part component, comprising the core **44**, the outer sleeve **43** and the top molding **600**. A seat fastened on the top molding **600** can execute elastic movements in the horizontal plane by virtue of the elasticity of the outer sleeve **43**, which is arranged between the core **44** and the molding **600**. Provided in the molding **600**, coaxially with the axial through-passage **45**, is a cutout **61"**, which allows access for a triggering lever **22** to the triggering push rod **23** of the pneumatic spring (see Figure 4A).

Figures 11A and 11B

In the case of the *fourth embodiment* of the seat mounting which is shown here, use is made of a *fourth variant* of a spring element **4**, which, once again, is fitted

onto a central column **2**. Here too, the sheath-like core **44** has the preferably conical axial through-passage **45** for accommodating the top end of the central column **2**. Once again, the core **44** has the shoulder surface **442** encircling the outside, and the elastic outer sleeve **43**, which in this case has a basically cylindrical outer circumference, is arranged on said shoulder surface. The molding **600'**, which covers over the outer sleeve **43** in a cup-like manner from above, is provided with a flange **601'** at the bottom. The core **44**, the outer sleeve **43** and the molding **600'**, which constitutes the casing, form the spring element **4**. Fixed connections between the core **44**, outer sleeve **43** and molding **600'** are more or less imperative for the functioning. A seat **3** fixed on the molding **600'**, preferably on the flange **601'**, can be moved elastically in the horizontal plane by virtue of the elasticity of the outer sleeve **43**, as in the case of the previous designs. The cutout **61''**, once again, is provided above the axial through-passage **45** of the molding **600'** in order to provide access for a triggering lever **22** to the triggering push rod **23** and/or a push-rod extension **21** of the central column **2**, formed by the pneumatic spring.